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93. Proposed by CHARLES CARROLL CROSS, Libertytown, Md.

Given $x^x + y^y = 285$, and $y^x - x^y = 14$, to find the values of x and y . [From *Bonnycastle's Algebra*, 1841.]

* * Solutions of these problems should be sent to J. M. Colaw not later than January 10.

GEOMETRY.

108. Proposed by NELSON L. RORAY, Bridgeton, N. J.

ABC is a triangle. O_1 , O_2 , O_3 centers of escribed circles. Prove altitudes of triangle $O_1O_2O_3$ are concurrent at center of inscribed circle.

109. Proposed by CHARLES CARROLL CROSS, Libertytown, Md.

Two circles, radii in ratio 3:1, centers A and O_1 , respectively, are drawn tangent externally to each other and internally to a given circle O , and on the same diameter; O_2 and O_2' are drawn tangent internally to O and externally to A and O_1 ; O_3 and O_3' are drawn tangent internally to O and externally to A and O_2 ; O_4 and O_4' are drawn tangent internally to O and externally to A and O_2' , respectively; and so on. Prove O_4 , O , O_4' ; O_5 , A , O_5' ; O_9 , A , O_3' and O_{10} , O , O_2' are collinear. [The letters apply to the centers of the circles.]

110. Proposed by P. S. BERG, A. M., Principal of Schools, Larimore, N. D.

If the three face angles of the vertical trihedral angle of a tetraedron are right angles, and the lengths of the lateral edges are represented by a , b , and c , and of the altitude by p , then $1/p^2 = 1/a^2 + 1/b^2 + 1/c^2$. [*Chauvenet's Geometry*.]

* * Solutions of these problems should be sent to B. F. Finkel not later than January 10.

CALCULUS.

83. Proposed by J. SCHEFFER, A. M., Hagerstown, Md.

From a given point, P , in the base AB of a triangle, to inscribe in the latter the minimum triangle, if its angle at P is given.

84. Proposed by C. HORNUNG, A. M., Professor of Mathematics, Heidelberg University, Tiffin, Ohio.

Find the equation of the curve upon which a given ellipse must roll in order that one of its foci may describe a straight line.

* * Solutions of these problems should be sent to J. M. Colaw not later than January 10.

MECHANICS.

77. Proposed by ELMER SCHUYLER, High Bridge, N. J.

At what elevation must a shell be projected with a velocity of 400 feet that it may range 7500 feet on a plane which descends at an angle of 30° ?

78. Proposed by ALOIS F. KOVARIK, Professor of Mathematics, Decorah Institute, Decorah, Iowa.

A cone and a cylinder having equal heights and equal circular bases are filled with